

WHAT IS CLAIMED IS:

1. A nitride-based semiconductor element comprising:
a substrate comprising a surface having projection

5 portions;

a mask layer formed to be in contact with only said
projection portions of said surface of said substrate;

a first nitride-based semiconductor layer formed on
recess portions of said substrate and said mask layer; and

10 a nitride-based semiconductor element layer, formed
on said first nitride-based semiconductor layer, having an
element region.

2. The nitride-based semiconductor element according
15 to claim 1, wherein

said substrate includes a substrate selected from a
group consisting of a sapphire substrate, a spinel
substrate, an Si substrate, an SiC substrate, a GaN
substrate, a GaAs substrate, a GaP substrate, an InP
20 substrate, a ZrB₂ substrate and a quartz substrate.

3. The nitride-based semiconductor element according
to claim 2, wherein

25 said substrate includes a sapphire substrate, and
said mask layer and said projection portions of said

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surface of said substrate are formed in the shape of stripes being parallel to the [1-100] direction of said sapphire substrate.

5 4. The nitride-based semiconductor element according to claim 2, wherein

 said substrate includes an Si substrate, and

10 said mask layer and said projection portions of said surface of said substrate are formed in the shape of stripes being parallel to the [1-10] direction of said Si substrate.

15 5. The nitride-based semiconductor element according to claim 1, further comprising a buffer layer formed on the interface between said recess portions of said substrate and said first nitride-based semiconductor layer.

20 6. A nitride-based semiconductor element comprising:
 an underlayer, formed on a substrate, consisting of a nitride-based semiconductor and comprising a surface having projection portions;

 a mask layer formed to be in contact with only said projection portions of said surface of said underlayer;

25 a first nitride-based semiconductor layer formed on recess portions of said underlayer and said mask layer;

and

a nitride-based semiconductor element layer, formed on said first nitride-based semiconductor layer, having an element region.

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7. The nitride-based semiconductor element according to claim 6, further comprising a buffer layer formed between said substrate and said underlayer.

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8. The nitride-based semiconductor element according to claim 6, wherein

said substrate includes a substrate selected from a group consisting of a sapphire substrate, a spinel substrate, an Si substrate, an SiC substrate, a GaAs substrate, a GaP substrate, an InP substrate, a ZrB₂ substrate and a quartz substrate.

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9. The nitride-based semiconductor element according to claim 6, wherein

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said underlayer includes a GaN layer, and
said mask layer and said projection portions of said surface of said underlayer are formed in the shape of stripes being parallel to the [11-20] direction or the [1-100] direction of said GaN layer.

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10. A method of forming a nitride-based semiconductor comprising steps of:

forming projection portions on a surface on a substrate;

5 forming a mask layer to be in contact with only said projection portions of said surface of said substrate; and growing a first nitride-based semiconductor layer on recess portions of said substrate and said mask layer through said mask layer.

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11. The method of forming a nitride-based semiconductor according to claim 10, further comprising a step of forming a buffer layer on said recess portions of said substrate in advance of said step of growing said 15 first nitride-based semiconductor layer.

12. The method of forming a nitride-based semiconductor according to claim 10, wherein said steps of forming said projection portions on said surface on said substrate and forming said mask layer include a step of forming said mask layer on the surface of said substrate and thereafter etching the surface of said substrate through said mask layer thereby simultaneously forming said projection portions on said 20 surface of said substrate and said mask layer coming into 25 contact with said surface of said substrate.

contact with only said projection portions of said surface.

13. The method of forming a nitride-based
semiconductor according to claim 10, further comprising a
5 step of growing a nitride-based semiconductor element
layer having an element region on said first nitride-based
semiconductor layer.

14. The method of forming a nitride-based
10 semiconductor according to claim 10, wherein
said substrate includes a substrate selected from a
group consisting of a sapphire substrate, a spinel
substrate, an Si substrate, an SiC substrate, a GaN
substrate, a GaAs substrate, a GaP substrate, an InP
15 substrate, a ZrB₂ substrate and a quartz substrate.

15. The method of forming a nitride-based
semiconductor according to claim 14, wherein
said substrate includes a sapphire substrate, and
20 said mask layer and said projection portions of said
surface of said substrate are formed in the shape of
stripes being parallel to the [1-100] direction of said
sapphire substrate.

25 16. The method of forming a nitride-based

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semiconductor according to claim 14, wherein
said substrate includes an Si substrate, and
said mask layer and said projection portions of said
surface of said substrate are formed in the shape of
5 stripes being parallel to the [1-10] direction of said Si
substrate.

17. A method of forming a nitride-based semiconductor comprising steps of:

10 forming an underlayer consisting of a nitride-based semiconductor on a substrate;

forming projection portions on a surface on said underlayer;

15 forming a mask layer to be in contact with only said projection portions of said surface of said underlayer;
and

growing a first nitride-based semiconductor layer on recess portions of said underlayer and said mask layer through said mask layer.

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18. The method of forming a nitride-based semiconductor according to claim 17, further comprising a step of forming a buffer layer on said substrate in advance of said step of forming said underlayer consisting 25 of a nitride-based semiconductor.

19. The method of forming a nitride-based
semiconductor according to claim 17, wherein
said steps of forming said projection portions on
5 said surface on said underlayer and forming said mask
layer include a step of forming said mask layer on the
surface of said underlayer and thereafter etching the
surface of said underlayer through said mask layer thereby
simultaneously forming said projection portions on said
10 surface of said underlayer and said mask layer coming into
contact with only said projection portions of said surface.

20. The method of forming a nitride-based
semiconductor according to claim 17, further comprising a
15 step of growing a nitride-based semiconductor element
layer having an element region on said first nitride-based
semiconductor layer.

21. The method of forming a nitride-based
semiconductor according to claim 17, wherein
said substrate includes a substrate selected from a
group consisting of a sapphire substrate, a spinel
substrate, an Si substrate, an SiC substrate, a GaAs
substrate, a GaP substrate, an InP substrate, a ZrB₂,
25 substrate and a quartz substrate.

22. The method of forming a nitride-based
semiconductor according to claim 17, wherein
said underlayer includes a GaN layer, and
5 said mask layer and said projection portions of said
surface of said underlayer are formed in the shape of
stripes being parallel to the [11-20] direction or the [1-
100] direction of said GaN layer.